THE VETERINARY RECORD

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888

No. 2. JANUARY 13, 1951 VOL. 63.

VETERINARY MEDICINE DURING THE PAST FIFTY YEARS

BY

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III. Pioneering Triumphs (continued)

The Revolution in Conceptions regarding Curative Treatment of Disease, resulting from the Newer Knowledge upon its Causation first gained during the immediately preceding Decades

THE ELUCIDATION OF THE NATURE OF THE ANIMAL TRYPANOSOMIASES AND OTHER ANIMAL PROTOZOAN INFECTIONS: THE ESSENTIAL MATERIAL THEREBY PROVIDED FOR BASIC CHEMOTHERAPEUTIC RESEARCH

We would have hesitated to summarise as at the close of the preceding instalment an old and oft-repeated story were it not for the fact that it is a fitting prelude to what we must now in duty bound declare to be an episode of nearly equal significance that took place within the strict purview of veterinary medicine almost contemporaneously. That episode, seldom mentioned and never adequately viewed in its proper historical perspective, was destined soon to have its repercussions elsewhere in heralding the disclosure of the origin of enormously widespread disease in both man and his animals. We would crave indulgence therefore if the space devoted to it may seem at first to be out of proportion compared with that sought for the other, now classical, episodes.

In text-books on veterinary medicine and on the specialised subject of protozoology, whether dealing with tropical diseases or the trypanosomiases, the disease *surra* is summarily dismissed as caused by *Trypanosoma evansi*, Steel, 1885, discovered by Griffith Evans in the horse in India in 1880. Then, to that statement, it may be added that it was the first discovery of a pathogenic mammalian trypanosome—a non-pathogenic one, *T. lewisi*, having been discovered in the blood of the rat, previously, in 1878, also in India.

Now, at last, having examined all the evidence surrounding Evans's discovery, and particularly in the light of the precious and timely information collected by our colleague Dr. R. F. Montgomerie in the brilliant biographical essay contributed by him to this journal in 1935 (*Vet. Rec.*, 1935, N. S. **15**, 890; see also *Ibid.*, 1212 and 1516; also *Vet. J.*, 1881, **13**, 1), we have in mind that Griffith Evans (1835-1935) may well deserve from posterity the title of "father of modern veterinary research." That is, it must be understood, if we restrict the title to those who have qualified as veterinary surgeons and have enquired, by what have since become accepted as modern methods, into a veterinary problem.

Otherwise, ten years earlier, in 1870, Pasteur himself, in his first exercise in disease investigation, which preceded his enquiries into the remarkable sequence of veterinary problems already mentioned, may well have prior claim to the title. Pasteur's report, one of the very few he contrived to write at full length, still reads like a romance in pioneering research. An epidemic disease of the silkworm, pébrine, had appeared in Italy and France at the beginning of the last century and was causing much distress among silkworm growers. A number of biologists were engaged on the problem; it was not until Pasteur, who had just established a reputation for eradicating a "disease" of beer, but had never, as he says in the introduction to his report, even seen any of the "precious worms" until then, was invited to undertake enquiry that, soon, after careful study of the causative organism now known to protozoologists as *Nosema bombycis*, and, from that information, applied simple measures of control, the disease was "stamped-out," and the silkworm growers restored to prosperity.

Much earlier, in 1705, Thomas Bates, Surgeon to George I, in his report (see Fleming's *Animal Plagues*, 1871, **1**, 223) on his successful and speedy eradication of an outbreak of cattle plague (rinderpest) after introduction into this country, by rational application for the first time of "stamping-out measures," furnishes good evidence, too, of an even prior claim. None of the modern tools of research, however, were brought into use. His methods illustrate well, nevertheless, how much can be achieved without them, when the unaided senses are fully used and then, gifted with keen insight, right deductions are made and the appropriate measures relentlessly applied. With each succeeding epidemic of the disease during the 18th century (which culminated in the movement among agriculturalists to found veterinary education in this country) and with the costly and destructive one during the seventh decade of the 19th century (in no small part attributable to the fact, it must be confessed, that veterinary education had become warped and distorted away from the intentions of the founders), the concise and wise precepts of Bates, and his contemporary, the Papal physician, Lancisi, were forgotten. This is reiterated here because it is strikingly apposite to the narrative of the present theme. The clamour that arose at once from the public, fostered by the presumed authority of the physicians, was from the outset to obtain a "cure." This prevailing obsession Bates, with the insight of genius into causation, had dismissed out of mind at once and offhand—even though revelation of the precise nature of the causative virus had to wait for over two centuries. It was certainly not available during the early part of the 50 years' period now under review.

Edward Coleman's striking success at the beginning of the 19th century in reducing to negligible proportions the disastrous losses among closely stabled army horses from pneumonia and other respiratory disease after insistence upon drastic methods of ventilation, accomplished just as much—as an anonymous, discerning reviewer stressed some years ago—as if he had been fully versed in modern knowledge. He may, of course, as F. Smith maintained, have been following the precepts

laid down earlier by James Clark, but it is to his credit even then that he broke down all resistance, and it was a stubborn one at the time, to their application. Again, a later example of this kind is the successful eradication of widespread glanders from the army in England by George Fleming while he was principal veterinary officer some time before mallein was actually introduced, namely, in 1894. It was only by the use of this diagnostic weapon in the hands primarily of William Hunting, after its efficacy had been clearly demonstrated experimentally by M'Fadyean, that the scourge was eventually brought under control among the then dense civilian horse population and finally totally eradicated in 1913. Were it not that the horse since the end of the second decade of the years under review has dwindled to a lowly position in the economic scale that no one could have foreseen at the opening of the period, that feat, of the eradication of glanders in England, together with the work accomplished, eventually by proper treatment, to reduce the horror of *surra* in India during the third decade, might have been put forward as two of not the least important among the major triumphs of veterinary medicine during the period.

There are present-day tendencies, some may suspect, with the " climatic " change that has overtaken enquiry, to place too much reliance on the use and refinement of modern tools. We are not unaware of this suspicion when we attempt to bring now into relief the real merit of Evans. The great merit of Pasteur, it has long been said, lay in the fact that, while constantly exposing himself to criticism, often bitterly hostile, from those who had acquired experience merely through the use of their unaided and " common " senses, invariably he answered that criticism, not by dialectic, but by devising a further experiment that was specially designed and well planned to give the information required. Then with a mind disciplined by early familiarity with one of the great natural sciences, namely, chemistry, the answer was complete.

The supreme merit of Griffith Evans, as has been stressed in the biography already mentioned, lay in his having, after qualifying as a veterinary surgeon, studied very carefully the methods of Pasteur and of Koch as they were being revealed to the world, and taking every step available to improve himself as such, just as Edmund Nocard, in an even more intimate way did a little later, too, in France. On arrival in India, in 1877, as a young army veterinary officer, he was therefore fully equipped for his task and within a short time accomplished it in the face of every obstacle. His achievement was that for the first time in veterinary medicine, instead of paying any heed whatever to the urgent clamour for a " cure," he stood firm in his convictions, based upon faith in the newer discipline ultimately to provide the answer destined to be complete.

The *surra* episode in its material, rather than moral, aspects may seem at this date trivial, concerned as it was with an exotic disease and a disease-producing micro-organism now reckoned among the most easily detectable of such organisms and immediately accepted, when detected and identified, to be the cause of disease in the affected animal if that animal belongs to any of the particular species well known to be liable to serious attack when infected by it. All that was not only unknown in Evans's day but he was confronted with clear testimony that in one species, the rat, an indistinguishable micro-organism had just been discovered which did not cause that animal to suffer visibly from invasion of the blood stream with the microparasite. Thus, after some preliminary experience in investigating anthrax, Evans was deputed to Dera Ismail Khan, on the North-West Frontier, in May, 1880, with the request that he be given every facility. He was at first confronted with strong objections from those in authority who honestly believed, according to the " common sense " reasoning of the time, that his mission ought to be concerned with exploring " cures " for the disease, and particularly from the head of the Medical Department. When he sought permission as a first step to transmit the disease artificially from naturally infected to healthy horses, that permission was denied him. That objection overcome, through the intervention of the Lieutenant-Governor of the Punjab, whose protection Evans had enlisted, he managed also to transmit infection to another species, the dog. He then took an infected pup to army headquarters at Simla to demonstrate the living micro-organism in it to the Surgeon-General, who was advised by Dr. Timothy Lewis. Their official denunciation of Evans's evidence was as vehement as their private manners were courteous. Before he could complete his investigations, which from the evidence contained in the report afterwards published, would have clearly led him on to the discovery of the natural mode of transmission, he was moved off to eastern India (Kachar, Assam) to undertake another enquiry into an outbreak on a tea estate, which proved to be anthrax. He was then posted to Calcutta, then the local army headquarters, and finding the official attitude still unchanged, he set about writing his report, which is now one of the classic masterpieces of recorded research. " Yet officially he was hounded for his views. He was regarded as a crank. He was forthwith sent from Bengal and transferred (exiled) for five years (to southern India) to be Inspecting Veterinary Surgeon of the Madras Presidency," an office appointment, where it was thought he would be well out of harm's way during the remainder of his Indian tour of service, returning to England at the end of 1885. The report, duly sent to army headquarters in the Punjab, " through proper channels," is affixed with the famous official covering note (*Vet. Rec.*, 1935, 15 N. S. 1212):—

" I am desired to forward, for the information of the Government of India, a copy of a report by Veterinary-Surgeon G. Evans, M.D., of his investigation into the nature and origin of the disease named *surra* which had recently been so fatally destructive among the horses of the 4th Punjab Cavalry, and which appears to be locally prevalent on the Dera Ismail Khan border.

" (2). His Honour will not at present offer any remarks on this interesting report, but he extremely regrets to observe that no cure for *surra* has been discovered."

Fortunately, as Dr. Montgomerie has noted, Evans took the precaution to send copies of his report to both Pasteur and Koch; and the copy which duly came into the hands of the Principal Veterinary Officer of the Army in India (Collins) was sent at once to George Fleming, Principal Veterinary Officer of the Army in England, who published it in full (without the affixed note) in the *Veterinary Journal* (1881 and 1882), of which he was editor. He had founded this journal in 1875, in large part to put out to the world at once important discoveries of this kind which he realised from his own experience abroad and his intimate knowledge of current developments on the Continent needed wide publicity. Whatever information David Bruce may have obtained direct through personal contact in England with Evans before he proceeded on the first stage of his great African discoveries, the full facts contained in Evans's report had been for some time easily accessible to him.

What we can now look upon as a great pity is that Evans was not in a position as the result of all the above frustrations to send an infected dog back to Europe at the time of his momentous discovery. For, if he had done so, the great discoveries resulting from Ehrlich's entry into the field of experimental research might have been anticipated by some years. As it was, the class of research which Ehrlich had the vision at once to perceive could be undertaken with the easily visible and manageable disease-producing micro-organisms which Evans had revealed had to wait until after 1896. To the public generally and the medical profession Ehrlich's name is best, and often only, remembered for his having discovered, in 1909, and released for general use after adequate clinical trials in 1911 the organic compound (" 606 "), salvarsan, an arsenical derivative, as a curative for human syphilis, far surpassing the various simple mercury and other compounds until then in vogue. It was he too, as we know, who introduced into the literature the term " chemotherapy," to denote a pursuit which has since been deservedly raised to separate and exalted status in pharmacology and experimental therapeutics. As Dale for long rightly insisted, the term, however, was, when it was introduced, entirely a misnomer in so far as it connoted any understanding whatever of the chemistry of either the host cell susceptible to attack or of the microparasite that would enable interference in their inter-relations to be devised deliberately. What was achieved was the result of patient trial and error (as the number " 606 " indicates) or of pure chance. In such trials, the possibilities were endless when the help of the skilled organic chemist was enlisted, such helper having it within his power to elaborate an infinite variety of new organic chemical compounds by modifying as he wished the structure of a member of any series which to the biologist, after testing on the infected animal, seemed promising.

The first to carry out systematic work upon the cure of disease by ascertaining the effects of a chosen drug upon the causative organism rather than by ascertaining its effects in ameliorating clinical symptoms was Dr. Alfred Lingard, and the disease at hand was actually *surra*, which then through the researches of Evans in the Punjab and Steel in Burma was well confirmed to be caused by the microscopically easily observable parasite, *T. evansi*. Lingard had been appointed, in 1892, by the Government of India, to a post then created which bore the title Imperial Bacteriologist (later to become changed to Director of the Imperial Institute of Veterinary Research). The duties laid down for him officially were to investigate the prevalent " anthrax and anthracoid diseases of the country," that phrase connoting adequately in the mind of officialdom at that time all infectious and contagious animal diseases, not excluding rinderpest and *surra*, which respectively were the most deadly scourges of cattle and horses. Lingard decided to concentrate his attention, however, at Poona, in the Bombay Presidency, entirely on a search for a cure for *surra*, which researches were published afterwards in voluminous reports. Forthcoming from this work was the conclusion that of all drugs tested the simple inorganic compound of arsenic, sodium arsenite, administered intravenously into infected horses and crude arsenious acid by the mouth, actually did sometimes cure them, when, if they were fortunate, it did not kill them. In 1899, when the Poona work was closed, and Lingard's attention forced to rinderpest, which necessitated transfer to more isolated surroundings, and his choice of the Muktesar Himalayan hill site, the sodium arsenite and arsenious acid discovery was well known in the European literature.

Meanwhile, too, David Bruce, then a young officer in the Army Medical Service, with a rising reputation from his officially interrupted work in the investigation of Malta fever (the cause of which he had identified in Malta in 1887 but was misnamed " *Micrococcus* " *melitensis*), was invited, in 1894, by the Transvaal Government to undertake enquiries into the cause of widespread and fatal *tsetse-fly disease*, known locally as *nagana*, among horses, asses and mules, and other animals in Zululand. In a few months (1895), Bruce furnished the preliminary report which became the prelude to the further fundamental researches into human sleeping-sickness. [For accurate summary of the latter researches from a contemporary worker, see Kleine, F. K. (1936). *J. S. Afric. Vet. Med. Assoc.*, **1**, 204.] The causal trypanosome of *nagana* was readily identified and its specificity as the infective agent established. Moreover, the mode of natural transmission, through the bite of the tsetse fly, *Glossina morsitans*, which had long been exclusively recognised locally as the natural mode, was experimentally established.

As far back as 1857, David Livingstone, doubtless checking a traditional local custom, had administered daily doses of 2 grains of arsenic for a week to a sick horse and noted a distinct improvement, but in six months, nevertheless, the horse died. Braid in the following year recorded having used arsenic against the effects of the bites of the flies. Bruce, too, in his preliminary report recorded a beneficial effect from the use of arsenic. Furthermore, Bruce despatched a dog which he had artificially infected from a donkey home to Europe and it was this which provided the starting point for the massive studies afterwards undertaken in laboratories upon the infective trypanosome and upon chemotherapy.

When Steel corroborated Evans's finding in Burma in 1885, the name he gave to the microparasite was " *Spirochaeta* " *evansi*, staining methods then not having been discovered to enable closer identification. The result of careful studies undertaken upon Bruce's micro-organism by Plimmer and Bradford enabled them to place it in 1899 in a genus apart (*Trypanosoma brucei*), to which the name *Trypanosoma* had been introduced by Gruby in 1857 to designate a much larger organism of the same kind found in the frog. However, for some time trypanosomes and spirochaetes were believed to be in close biological proximity.

The enormous literature which soon grew around this subject is testified by the facts that in 1892, Laveran and Mesnil were able to summarise it in 12 pages; then, in the first edition of their book (1904) it took 418, and, next, in the second edition (1912) about 1,000 pages, which year saw the establishment in England of the Sleeping Sickness Bureau to collate all reports, the bulletins soon to comprise all other information forthcoming upon tropical diseases, in the *Tropical Diseases Bulletin*, with which the collateral publication, the *Tropical Veterinary Bulletin*, was separately issued, to merge later, in 1932, into the present *Veterinary Bulletin* and *Index Veterinarius* with the founding of the Imperial (now Commonwealth) Bureaux of Animal Health. Both publications, it may be said, have proved an untold boon, in promoting rapid and co-ordinated advance in veterinary medicine which can only be estimated for its full worth by the earlier workers who laboured without it.

To return to the chemotherapeutic aspect, the efficacy of simple arsenic compounds was soon confirmed in European

laboratories upon mice artificially infected with the trypanosomes, fortunately Bruce's strain from the outset proving suitable for this purpose. Other strains, too, could be made suitable. Ehrlich during his early training had been impressed by one of his teachers, Heubel, who maintained that in lead poisoning certain tissues retain the chemical selectively. Thereafter, his first work was to obtain confirmation, and he chose various dye-stuffs for this purpose, because their tissue affinities could be easily observed after introduction into the blood stream, finding therefrom that some cells or tissues were coloured by these dyes while others remained uncoloured. An offshoot of this work was that he found on applying the selective dyes to bacteria and protozoa, they too had a remarkable affinity, more especially for the methylene blue which had coloured some tissues in the body with a remarkable degree of specificity, leaving others uncoloured. He proceeded to investigate this property as applied to the malaria parasite of man, which had been discovered by Laveran in 1880. Though by 1891 he had proved that methylene blue could be employed as a curative agent with some effect to relieve the symptoms of malaria infection in man, its effects in this respect were not so much better than those of the quinine then in general use as to warrant the replacement of the latter drug. However, in Ehrlich's laboratory and elsewhere that finding was to be the starting point of a remarkable succession of trials of dyestuffs and related compounds for the cure of artificially induced trypanosome infections, which culminated eventually in the discovery of Naganol (" Bayer 205 ") in 1919, a compound related to trypanblue, but, curiously, colourless, as the most effective remedy then known for the treatment of both *surra* and *nagana*, *i.e.*, diseases caused by trypanosomes of the *brucei-evansi* group. Those of the other two great groups (*congolense* and *vivax*), which have, contrarily, a specially high pathogenicity for cattle, had to await the recent discovery of compounds, of the phenanthridinium series and of " antrycide," before similar effects could be achieved.

A curious phenomenon in all the massive researches undertaken to the end of discovering a compound most suitable for the treatment of a given specific disease is that, after all, the compound, or a similar one, has sometimes turned out to be most efficacious against an entirely different disease or for a wholly different purpose. Hence, one of Ehrlich's preliminary discoveries (with Shiga) in 1904 was that a compound belonging to one series of dye compounds, namely, trypanred, was highly effective, both prophylactically and curatively, upon mice infected with trypanosomes of the *brucei-evansi* type (*T. equinum*). It proved, however, of little use upon other species and was of no use in practice. The discovery, however, led the French workers at the Pasteur Institute, Nicolle and Mesnil, to introduce two similar compounds of the same series, trypanblue and afridol violet, which proved to be effective against infection in both mice and cattle infected with *brucei*. Fortunately, they did not know that cattle, in any case, are ordinarily relatively highly resistant against trypanosomes of this type, because, if they had known, their conclusions would not have been so sanguine. For, when Nuttall undertook study of protozoan infections at Cambridge the group he chose was the piroplasms, doubtless consequent upon his special interest in the ticks that were then the proved vectors. A strain of the " malignant jaundice " piroplasm (*Babesia canis*) of dogs was obtained by him, and after testing all the synthetic drugs found favourable by Ehrlich and the French workers, he was struck (1909) with the almost magical effect of one of them, trypanblue, in the cure of the disease. This led to its trial in the following year (with Hadwen) in the treatment of piroplasmosis in cattle. Most fortunately, it was a strain of the tropical form (caused by *B. bigemina*) which Stockman happened to be propagating in this country that was placed at his disposal. Again, trypanblue produced dramatic effects and became the sheet-anchor in treatment of this form. If he had tried the drug upon the common British form of " redwater " (caused by *B. bovis*), his hopes would have been damped, for effective treatment of this form had to await the introduction, in 1934, of " acaprin " (pirevan, etc.) elaborated on similar lines by German workers.

Again, while investigating a promising series of dyes, the acridine series, a member of which (malachite green) Ehrlich had found to have some curative action on experimental trypanosomiasis, another one, " trypaflavin " (now " acriflavin "), was found to have considerable trypanocidal activity and low toxicity for mice. Though it turned out to have no use in practice as a curative agent it came to have, as is well known, extensive use therein as an antiseptic and disinfectant.

Now, for long, nothing but failure, ever since the days of Koch's crude trials upon mercuric chloride in the treatment of anthrax, attended patient exploration on similar lines in the treatment of diseases caused by bacterial infections. However, the tradition continued fortunately in German laboratories of deliberate testing of all likely compounds. Then suddenly a member (Domagk) of the same group of workers as had just elaborated acaprin, hit upon a long known member of the relatively simple series, the sulphonamide series (namely, prontosil), as a drug which proved strikingly effective in the treatment of artificial pneumococcus infection in mice. [See Hörlein (1935), *Proc. Roy. Soc. Med.*, **29**, 313.] The writer well recalls being present at the small sectional meeting addressed by Hörlein, being then deeply interested in the " acaprin " announcement, the " prontosil " announcement, as it was at that stage, interesting only a very small group of research workers on the medical side. However, that announcement was destined to herald complete transformation of prevailing conceptions concerning the therapy as well as the prognosis of many of the most prevalent and distressing common microbial diseases of both animals and man. The subsequent developments, regarding not only the sulphonamides but also their stimulus towards exploitation of the antibiotics need not be recapitulated. It is sufficient to have attempted to delineate the moral genealogy of all these discoveries.

Before leaving this line of advance, though the ultimate discoveries that became so fruitful are on the whole of more intimate concern to human medicine than to veterinary medicine, it is essential to delineate them briefly in vindication of the important contribution of the latter towards their achievement.

The pursuit of research into compounds containing arsenic continued alongside the above search for arsenic-free compounds in chemotherapy, and though the derivatives have had little application in veterinary medicine, except in the treatment of fowl spirochaetosis, it is interesting to recall that it was research upon this disease that led Ehrlich and Hata, in 1911, to announce their momentous discovery of salvarsan in the treatment of human syphilis. Shortly after the young German worker Schaudinn had brilliantly discovered, in 1905, the cause of this disease to be a spirochaete (*Spirochaeta pallidum*, now *Treponema pallida*), Ehrlich chose deliberately the common fowl spirochaetosis, or spirillosis, for

investigation. It had already (1905, Thomas and Breuil) been found that an organic arsenical compound, atoxyl, which cured trypanosomiasis in mice, had a much more favourable "chemotherapeutic index" (ratio between curative dose and toxic dose) as compared with the crude, inorganic, arsenious acid, and trials in Africa by Koch pointed to its efficacy, though not without some danger, due to optic nerve atrophy, in the cure of human sleeping sickness. This led Ehrlich (with Bertheim) to examine more closely the true organic structure of atoxyl. Having discovered (with Roehl) in 1909 why originally (in 1903) he had failed to demonstrate any trypanocidal activity of the drug *in vitro*, namely, that to acquire that activity it needed reduction (as could occur in contact with body tissues) to the trivalent form, he became convinced that certain arsenobenzene derivatives would be found efficacious. Other workers had already found that atoxyl itself cured fowl spirillosis, as well as syphilis in apes and rabbits and even humans. Eventually, with Bertheim, one such derivative was found at last to excel well above the rest, and, after further tests on rabbits found to contract mild disease after intratesticular infection with Schaudinn's spirochaete direct (with Hata), in 1911 it was reported to cure human relapsing fever (which had not yielded to atoxyl) as well as human syphilis and trypanosomiasis. Next year, after further research, a more soluble compound, neosalvarsan (" 914 "), was elaborated, and after careful trials Ehrlich allowed it to be put on the market. Hence, in that momentous discovery, the choice of disease and animal subject for enquiry had actually again been within the realms of veterinary medicine.

Antimony and bismuth, belonging to the same group in the " periodic " table of the chemist, had also become meanwhile the objects of trial. The trypanocidal effect of the simple organic antimony compound, tartar emetic, had been demonstrated since 1908, and afterwards, until the very recent discovery of the far more efficacious agents already mentioned, it was employed, with much success, too, to control the common African bovine trypanosomiasis caused by *T. congolense*. In 1912, its introduction (by Vianna) into the chemotherapy of leishmanial infections brought about an enormous reduction in the death rate, by 90 per cent., among human sufferers from the common form (*Kala-azar*) in India. The use of the drug and its variants in the treatment of certain helminth infections, especially those caused by cestodes (such as the scourge of bilharziasis in Egypt) is well known.

Not much less significant as a contribution from veterinary medicine in the broadest sense to human medicine has been the revolution recently brought about in both the prophylaxis and therapy of human malaria, the microparasites being not far related from the piroplasms. Here, the traditional quinine therapy still held its ground, in spite of the introduction of the synthetic compounds, plasmoquine and atebrin, which for certain stages in the malarial cycle were found to have some superiority. Neither, however, had any appreciable prophylactic effect, and, curiously all along, in spite of the intensive research carried out upon malarial treatment, it had not been appreciated by medical research workers that an essential stage in the cycle had been overlooked. It had long been known that other species of malaria parasites attacked birds, and it was by work on one such susceptible bird, the canary, in India that Ross, in 1898, had definitely proved that such parasites underwent some essential stages of development in mosquitoes, which soon was confirmed (by Grassi and Feliti) to apply also to human transmission. Why the whole cycle was not soon completely elucidated it is hard to understand, except that the passerine birds then used in laboratories were difficult to work upon because of their small size. That gap in malarial research seems to have been appreciated fully only by the great French parasitologist, Brumpt, who was alert to any reported discovery of the parasites in the larger, gallinaceous, birds, and voyaged specially to the Far East in an endeavour to secure genuinely infected birds of this class. Most fortunately, he called on his way back at Ceylon, where our esteemed veterinary colleague Crawford (see *Vet. Rec.*, 1945, **57**, 395) had reported an outbreak of malaria among domestic fowls. Most fortunately, again, Brumpt was able to secure from him some infected live specimens to bring back to Europe. Now, what with the opportunities made available for check on the human subject by the establishment in current practice of controlled malarial infection in the treatment of " generalised paralysis of the insane," it was soon discovered, by parallel examination of the tissues of fowls from the moment of infection, that failure of the drugs already in use was caused by an essential stage in the developmental cycle previously overlooked. This stage took place outside the red blood cells, but could readily be demonstrated microscopically inside certain tissue cells (the " exo-erythrocytic " forms) of the fowls. Intensive research by workers of the Imperial Chemical Industries (Curd, Davey, and Rose) very soon (1945) enabled them to synthesise an entirely new kind of chemical compound (paludrine) which not only was somewhat more efficacious in curative treatment but was also noxious towards the earliest stage in the cycle after introduction of the parasite by the mosquito bite and so could be employed as a preventive, to destroy it before it secured any foothold in the tissues. Thorough investigation of the possibilities of the new drug (Fairley, 1946) as a real and safe preventive upon human volunteers led to the elimination of malaria afterwards in notoriously infected territories, such as our own troops had suffered in Burma in the Second World War and in Salonika in the First World War, and now whole territories formerly bearing an evil reputation for " fever " have been, or are being, rendered salubrious. Since then, the exo-erythrocytic forms have actually been demonstrated to occur, too, in the tissues in the various types of malaria of the human subject.

The history of the introduction of such agents as male fern extracts and carbontetrachloride into veterinary medicine as more efficacious agents against cestode infestation and of phenothiazine against nematode infestation, both discoveries representing great advances, are merely mentioned here: the circumstances of their introduction and use are well within the recollection of most readers.

In concluding this instalment, it need hardly be said that although much has now been achieved in the way of advance in veterinary medicine following the lines which have been traced to their origin as above, the possibilities of further advance along these lines are immeasurable. We can now see more clearly why it was that Leclainche, at the close of what he called the Golden Age, bemoaned that veterinary practice had hardly benefited at all from the spate of enthralling discoveries that had been recorded during that Age. During the subsequent 50 years the genius of that Age proved to have forged the weapons for advance, the advance itself striking out then through difficult territory and against formidable obstacles which had been only partially overcome until the present century was well under way.

In the obituary notice on Evans in this journal it is mentioned how his research paved the way for the great researches of Sir David Bruce and his colleagues upon tsetse-fly disease and human sleeping sickness in Africa at the beginning of this century. Previously that stalwart pioneer—and fine figure of a man—had had similar experiences to Evans's own in the course of his own classical investigations into Malta fever in man. As a young officer in the Army Medical Service stationed in Malta he had discovered, in 1887, the causal organism of that troublesome disease and was well on his way, as Evans had been with *surra*, to discover the natural mode of transmission. Army officialdom, however, thought better as to how he was to dispose of his time and moved him off to Egypt. It was left to Zammit and others, in 1905, under a Commission, to prove what was the decisive link in transmission, namely, the goat, through its milk. Had Bruce been able originally to trace the carrier species and pursue observations upon it, doubtless he would have found the relation between the disease and the common contagious abortion, the causal organism of which was discovered by Bang, at Copenhagen, in 1896. It was left to the American worker, Alice C. Evans, in 1918 almost by chance in the laboratory to reveal the close similarity between the two organisms. Many years were thus lost. Small wonder therefore when at the close of a triumphant active career he had become Chairman of the Board of Governors of an institution which for many years was the foremost and only large one devoted to medical research, the Lister Institute of Preventive Medicine, and which, under the inspiring lead of Sir Charles Martin, who would brook no semblance even of official "administration" within it, turned out work which all bore the hall mark of integrity, Bruce was determined to preserve it as a haven sheltered from the torments of officialdom. Hence, he stood adamant against its adoption as the headquarters of official medical research when, at last, public funds were forthcoming from Government to promote that kind of research after the passing of the novel and necessary legislation during the years immediately preceding the First World War. This reflection may perhaps seem out of place in an essay of the kind just written, which itself invites adverse criticism, on the one hand, from specialist technologists on the score that it is "over-simplified," and, on the other hand, from the ordinary veterinary surgeon in general practice, that it is "over-complicated." It is hoped that those of the latter class will not be many. *The essay is written for them* to commemorate the passing of 50 years and to point out in outline how in one direction at least real advance has been made, and will yet be made, and suggest, as it must, the ways of promoting advance, and not impeding it. After all, as Leclainche has reasoned in his great historical book, it was the officialdom, not at the time of the Military or of the State but of the highly organised Western Church which contrived to keep the whole of veterinary medicine in thraldom for well over a millenium, denying to it a standing above the basest, because that officialdom forbade, as a "heresy," studies that assimilated man to other animals. It was not Christianity, or any faith like it, as might be lightly implied on reading Leclainche's texts, that did it: otherwise Evans would not have been inspired to hold out as he did, any more than Newton, Faraday, Pasteur and many others before him. But, still, resistance to the "heresy" dies hard.

(To be continued)

EQUINE CASTRATION

BY

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The following words embody little more than a plea for the general castration of equines as foals, rather than as yearlings or two year olds.

The view has long been held by the writer that from the point of view of castration the horse had just as much claim on our humanitarian instincts as the lamb, the calf, the young pig and the kitten. Many male foals are destined for emasculation immediately they are born, yet they invariably must wait at least one or two years for the operation. During the past three years 18 foals, mostly from ponies of various types, have been castrated at ages varying from six to 14 weeks, up till now, with infinite ease and with no untoward sequelae. In all animals both testicles have been in or near the scrotum. The method of castration is as follows:—

ANAESTHESIA.—Using a large Wright's dog mask over the upper jaw or a Cox's mask over both jaws, the foal is anaesthetised in the standing position with the anaesthetist assisted by one or two men. An initial dose of 1 drachm of chloroform is applied to cotton wool in the mask and limited air is allowed. There is some resentment to the chloroform vapour, but no undue struggling, and within four to six minutes relaxation is such that the foal sinks to the ground. At this stage small webbing hobbles may be applied with the uppermost hind leg restrained separately, and drawn forward to expose the operation site. With small lighter-bred foals it is often only necessary for the upper hind leg to be held forward by hand. The area is palpated to determine the presence of the testicles, and the site is prepared in the usual preoperative manner during the time the anaesthesia is taken to surgical level. A drape with a central window exposing the scrotum is used to avoid undue contamination. With relaxation of the spermatic cord and external cremaster muscle either testicle is easily grasped and kept in position by means of the index finger and thumb of the left hand. An adequate incision through skin, dartos and scrotal fascia exposes the testicle in its tunica vaginalis reflexa, which is separated down to the external inguinal ring from surrounding fascia. The tunica vaginalis reflexa is incised and the scrotal ligament severed to allow the vascular portion of the cord to be ligated with No. 2 chromic catgut as near to the external inguinal ring as possible. The cord is then severed with scissors, scalpel or emasculator. The vaginal sac is now twisted and closed as high up as possible with a transfixing No. 2 chromic catgut ligature, and surplus vaginal tissue removed. The skin incision is closed with two or three interrupted sutures again using No. 2 chromic catgut, so that subsequent removal is unnecessary. In foals of heavier breeds it is sometimes advisable to eliminate scrotal dead space by coapting the connective tissue by a continuous suture, or two or three interrupted sutures using catgut. Following removal of both testicles, tetanus antitoxin is given subcutaneously, and the foal allowed to recover and return to its mother. The actual operation occupies no more than eight to 12 minutes, and with the removal of the mask the foal is generally on its feet within a further ten to 30 minutes. Depending upon atmospheric temperature and rate of volatilisation, the

FIG. 3

amount of chloroform found necessary for surgical anaesthesia has varied from 2 to 6 drachms. There is no post-operative interference. Inspection at 24, or 48 hours reveals the minimum of tissue reaction, and although occasionally oozing has produced a small haematoma, the wounds have been left severely alone.

Fig. 1.—Foal Prior to Castration, to Show Testicles in the Scrotum.

Fig. 2.—To Show Scrotal Skin Sutures.

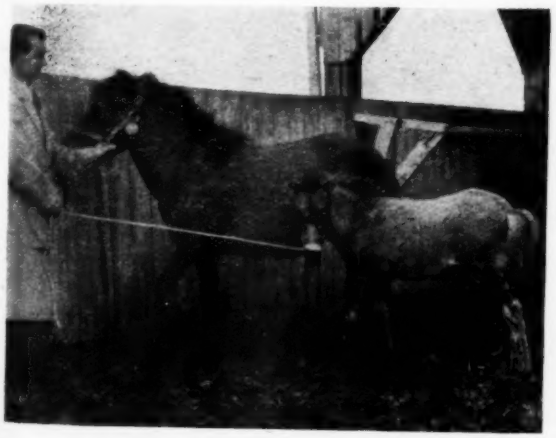

Fig. 3.—Foal, with its Mother, Immediately after Operation.

Fig. 4.—Three Yearling Ponies Castrated as Foals.

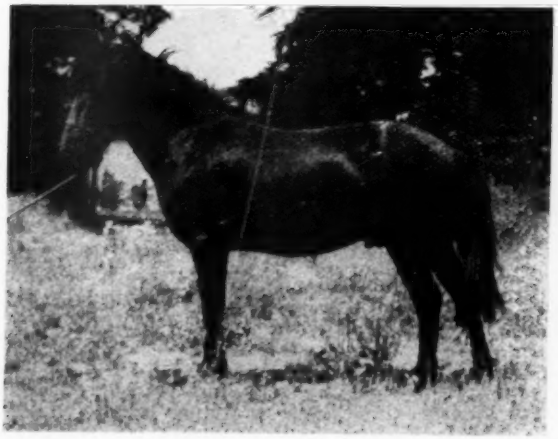

Fig. 5.—A Three-year-old Castrated as a Foal.

Discussion.—In the process of time mankind tends to become more and more humanitarian in its outlook towards animals, as witnessed by the latest amendments to the Animal Anaesthetics Act, and the abolition of the docking of equines. Any step in this direction should be encouraged by the veterinary profession. It is not suggested that what is now contributed is in any way original, but, at the same time, a search of the literature has not revealed anything on the lines proposed. As far as the writer can visualise there can be no disadvantage or objection to castration in extreme youth. No claim in respect to interference with growth or physique can be substantiated. The testicles are present in the scrotum many months before birth, and it is fallacious to believe that the testicles leave the scrotum at birth for varying periods. The problem of the cryptorchid is likely always to be with us, and must remain outside the scope of this discussion. Efficient anaesthesia is practicable, safe and easy to induce.

(*Concluded at foot of next page*)

CLINICAL COMMUNICATION

MYCOTIC INFECTION OF THE SKIN OF THE TURKEY

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A peculiar skin disease was encountered among a batch of turkeys in Oxfordshire in which two fungus infections were demonstrated—a streptothrix and a monilia. It is believed that the condition was due to the streptothrix and that the monilia was a contaminant which had come from infected mouth ulcers. So far as the authors have been able to determine, cutaneous streptothricosis has not been recorded in birds before, nor has skin moniliasis hitherto been reported in the veterinary literature.

HISTORY OF THE CASE

The head and neck of a stag aged nine months which had died from blackhead was sent to this laboratory for a report on the skin lesions shown on the head. The skin and snood were covered with crusts of granulomatous appearance, and there were necrotic ulcers in the corner of the mouth on both sides. Routine examination was negative for ringworm and acari and direct smears from ulcers showed yeast-like cells which on culturing on Sabouraud's agar gave candida-like colonies.

Investigation on the farm revealed the following history. A batch of turkeys hatched in May, 1949, was run out on a clover ley and fed turkey-chick starter until mid-November, when the whole batch was transferred into two Motley verandas, being then fed grain balancer meal, together with chopped kale. Prior to transfer it was noticed that the stags showed scabs on their heads. This was at first thought to be due to the high protein ration fed, so that just before Christmas a change was made to a home-produced grain mixture, which was continued for about a month. The egg yield, however, dropped and they were later fed grain balancer meal, grain and chopped kale. Between mid-December and mid-February further verandas were built so that a total of five were now in occupation, each containing one stag and eight to nine hens. Of a total of 49 turkeys, one stag and two hens appeared grossly affected and eventually all the other birds had a greater or lesser number of lesions.

Later information revealed that during the time the turkeys were running on the clover ley, they could, and did, wander into a neighbouring sewage farm.

SYMPTOMS AND LESIONS

The lesions appeared in the form of a thick crust affecting all parts of the head, the snood and the eyelids, occasionally extending to the commissures of the beak and into the mouth.

Itching was not pronounced in slightly affected birds. There was, however, a slight but distinct tenderness which could be detected on palpation. Birds that were severely affected frequently scratched their heads and showed some dullness and depression. The condition of the birds, apart from the question of low hatchability, was well-maintained, except in one bird in which the eyelids were involved and almost closed.

The early lesions noticed were localised, slightly raised patches, mainly on the face and snood, with scab formation. These spread over the greater part of the skin of the head and extended to the skin of the neck. Affected areas of the skin later became thickened, hard and raised, and gave the appearance of granulomatous tissue covered with crusts. The infection spread to the eyelids and when the first case was examined it suggested contagious epithelioma (fowl pox). When a localised lesion was palpated, the hardening of the skin was apparent and, as the disease progressed, these areas coalesced, covering the whole of the skin of the part affected. The scabs became progressively thicker, owing to the continuous addition of more material from the underlying skin. The thickness of these crusts reached one-third of an inch in some parts and the scabs were dry, hard and of yellowish-white appearance. Long-standing scabs were more easily removable than new ones, which were removed only with difficulty. When removed by digital manipulation, the former revealed a hollow crater of a pale yellow colour without pus and the latter a red, raw, bleeding surface. After removal, fresh scab formation was rapid.

Advanced lesions are shown in Fig. 1.

FIG. 1.—Affected turkey hen showing well developed lesions over the skin of the head, around the eyes, and all around upper and lower beak.

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cont. from p. 19

The physical risk to patient and operator is negligible. The operation is on a par with the highest principles of modern surgery, and the dangers from haemorrhage and post-operative herniation are entirely eliminated.

It is recognised that it is inevitable that certain horses of all types cannot be operated upon until adult life for obvious reasons. On the other hand, as previously stated, the majority are destined for emasculation from the day their sex is revealed.

Acknowledgment.—Most of the subjects operated upon have been put at our disposal through the good offices of Dr. W. S. Gordon, Director of the A.R.C. Field Station, Compton. We appreciate his kindness and helpful co-operation. I would thank my colleagues in the Surgery Department for their assistance, and Mr. E. J. R. Roberts for taking the photographs.

Determination of Cause

Since the clinical picture gave the impression of contagious epithelioma (fowl pox), material was sent to the Veterinary Laboratory at Weybridge on three occasions from February to April, 1950, for transmission experiments, but the results were negative.

Scabs from lesions were examined by smear on six different occasions for evidence of ringworm and acari, with negative results. Cultures for ringworm were sown on Sabouraud's agar slants after the technique described in Kolmer and Borner (1949) and incubated at 37° C. and at room temperature for four weeks, with negative results. Anaerobic cultures were also negative.

Direct wet smears taken on the farm from skin scrapings or prepared in the laboratory from emulsified scabs, revealed a number of yeast-like cells, some of them showing budding and some fine filaments (Fig. 2). These filaments were abundant in smears from emulsified scabs and fewer in number in smears from skin scrapings. Direct wet smears taken from the surface of the skin after removal of scabs showed more filaments and fewer yeast-like cells. The filaments seen in all these smears were of uniform thickness, homogenous, non-septate and very few showed actual branching.

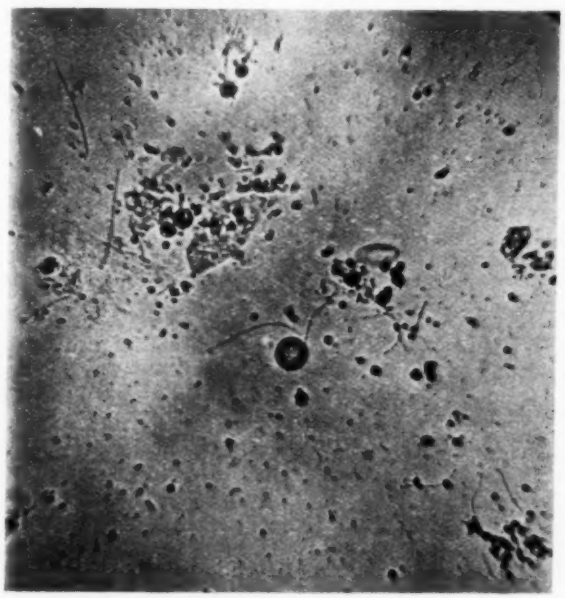

Fig. 2.—Wet smear of emulsified scabs revealing a number of yeast-like cells and fine filaments × 300.

To determine the exact morphology of these mycelia, similar smears prepared as before were stained by the following methods: Gram's stain, Claudius Gram stain, Giemsa, and Mallory's stain for actinomyces. Examination revealed the same picture. The mycelia were of uniform thickness ranging from 0·5 to 0·8μ in diameter and were of varying lengths from 10 to 100μ.

The mycelia did not appear to be of a homogenous nature and those stained with Gram's stain, Mallory's stain and Claudius Gram method were revealed to be of a granular nature. Some were fragmented towards the ends as shown in Fig. 3. Scattered in the field in all smears were numbers of cocci lying singly or in pairs, and generally pleomorphic.

Fig. 3.—Stained smears of emulsified scabs showing fragmentation of end of filaments, notice blood cell from freshly removed scab [Mallory's stain for actinomyces × 300].

Culturing from the emulsified scabs and from mouth lesions gave a very heavy growth of yellowish-white colonies which proved to be typical *Candida albicans* and the condition was suspected at that stage to be either a pure case of dermatomoniliasis or a spread of monilia from mouth lesions.

Owing to the fact that monilia is a saprophytic yeast and as the morphology of mycelia revealed in smears was not that of the known monilia (filaments with septation and club formation) and to reach a correct diagnosis, skin lesions were collected for histological examination.

Histopathology

Because of the very thick crust over the long-standing areas of infected skin, lesions were collected where the crust was least developed and sections were stained with Mallory's stain for actinomyces and Claudius Gram for fungus and with haematoxylin and eosin and Heidenhain's iron haematoxylin for the histological study of changes in skin structure.

Examination of the sections stained for fungus showed the following two main findings:—

(1) Yeast-like cells dispersed in the corneal layer of the skin, some of them in a budding state the size of which varied between 5μ to 12μ. These cells were seen only in the corneal layer and not in all sections (Fig. 4).

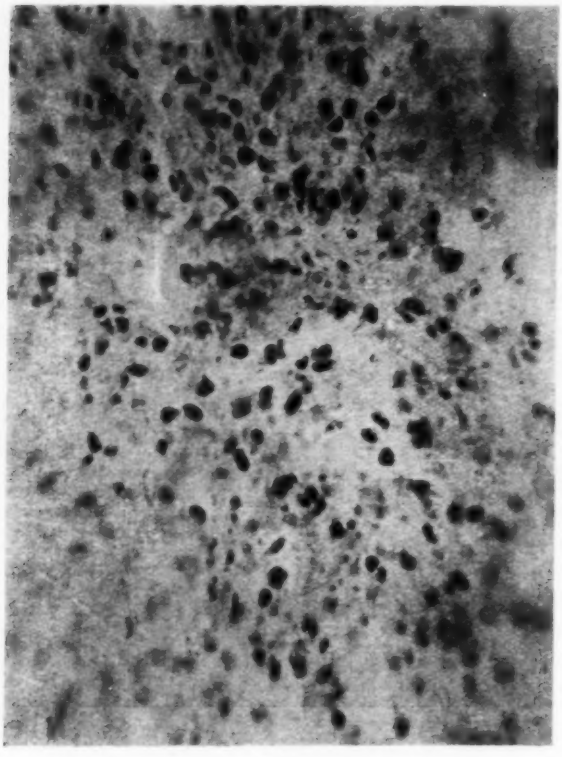

Fig. 4.—Skin section—showing yeast cells in the corneal layer [Mallory stain for actinomyces × 1,000].

(2) Mycelia, which were seen mainly in the granular layer as a thick mass of filaments generally lying with their long axis parallel to the surface of the skin. These mycelia were rarely seen in the cornified layer, being mainly seen invading the stratum granulosum and some of them dispersed deeper still in the germinal layer among the prickle cells. As a whole most of the mycelia were of uniform thickness of about one micron and not of the branching type. Their length varied from a few microns up to 50μ, being shorter than the filaments found in smears from the scabs.

Closer examination showed these filaments not to be of solid nature and to be composed of rows of disc-like bodies arranged with their axis across the filaments. These stained deeply with Mallory's stain in contrast to the lighter homogenous stain of the matrix. The same picture was seen with Gram stain with which the coccoid bodies in these filaments stained gram-positive. At the end of some of these filaments the coccoid bodies were seen to be breaking into separate units which appeared to be oval in shape. In all the sections that were examined these mycelia were of one coccoid cell width only. Study of the morphology and staining character of these disc-like cells has shown them to be arranged in rouleau formation in the mycelia. It would therefore appear that they are organisms of the streptothrix group (Fig. 5).

Examination of sections stained with haematoxylin-eosin and with Heidenhain's iron haematoxylin revealed the following changes in the skin structure:—

Fig. 5.—Skin section—showing mycelia and the coccoid elements arranged in rouleau formation [Mallory stain for actinomyces × 1,200].

1. The seat of the invasion of the streptothrix organisms was found to be mainly the stratum granulosum, the cells of which were hyperplastic and actively proliferating, thus leading to increased thickness of this layer. The mycelia were seen between the cells of this layer with a tendency for their long axis to be parallel to the surface of the skin.

2. The prickle cell layer was thrown into substantial folds protruding into the subcutis. The cells of this layer were hypertrophied, becoming swollen in the vicinity of the invading organism (Fig. 6).

3. Pyknotic nuclei were observed in the granular layer.

4. As a result of the hypertrophy and rapid proliferation of the cells of the germinal layer, rapid cornification was occurring. The process of cornification in some parts was premature, and thus, although the layer stained homogenously, the cell walls could not be distinguished, whereas the nuclei still retained the stain.

5. Some areas just in between the stratum granulosum and the stratum corneum were filled with blue staining granules, the significance of which is indefinite, since they do not have a typical nuclear structure neither do they show budding, nor were they of sufficient size to justify their being regarded as candida spores.

6. At the point of invasion of the organisms there was a distinct inflammatory process with leucocytic infiltration.

7. A pronounced leucocytic infiltration was observed in the outer side of the papillary layer, mainly at the base of the malpighian layer where it was thinnest between the bulges described (No. 2 above) and sometimes at the bases of these bulges (Fig. 7).

Fig. 6.—Skin section—showing normal skin structure at upper part and affected area below. Notice the folding of the prickle cell layer and the thickened corneal layer [Haematoxylin-eosin × 20].

Fig. 7.—Skin section—showing leucocytic infiltration in the outer side of the papillary layer at the base of the stratum malpighii. Principally where the stratum malpighii is thin[Haematoxylin-eosin × 70].

Bacteriological Examination

The organism isolated from the mouth ulcers and that obtained from the scabs collected was identified by the following characteristics:—

The fungus was easily isolated on Sabouraud agar and gave a heavy growth from mouth ulcers and from scab emulsions on primary culture after 24 hours' incubation at 37° C. The colonies were round, dome-shaped, greyish-white in colour and 1 to 2 mm. in diameter. Microscopical examination of wet, unstained smears showed masses of yeast-like cells, with visible budding.

Cultures on cornmeal agar, incubated at 25° C. for three days, gave the characteristic hyphae bearing clusters of buds and chlamydospores (Fig. 8).

Fig. 8.—Culture of *Candida albicans* on corn meal agar showing the typical clamydospore and cluster formation [three days incubation at room temp.].

Fermentation Reactions

The following reactions were obtained:—

Lactose	...	No change
Maltose	...	Acid and gas
Sucrose	...	Slight acid
Glucose	...	Acid but no gas
Galactose	...	Slight acid
Levulose	...	Acid and gas
Inulin	...	No change
Raffinose	...	No change

No pellicle formation was obtained on glucose broth or any of the foregoing sugars.

Calcium lactate milk (Stovall, 1932) was clotted by this yeast in 48 hours, showing that it was of the pathogenic type, and on testing by injecting into rabbits and mice, it killed both in 48 hours and the fungus was recovered from the kidneys, liver and lungs. This showed this fungus to be a pathogenic strain of *Candida albicans*. Owing to the fact that this fungus was occasionally found in skin sections only in the corneal layer, it is considered to be a contaminant from the mouth lesions.

Because of the high incidence of contamination in the scabs and owing to the fact that the lesions were treated with iodine preparations, isolation of the invading mycelium (which in skin sections was morphologically identical with streptothricosis) by direct culture was not possible. The streptothrix has, however, been isolated after dehydration in sulphuric acid fumes. Further study on this organism is intended.

Discussion

Two pathogenic fungi were found to be associated with this mycotic dermatitis. One was isolated and bacteriologically identified as *Candida albicans* and the other proved morphologically to be a streptothrix. In considering the actual aetiology of this condition one must take into con-

sideration the fact that streptothrix mycelia were found in every section examined—invading the stratum granulosum and the outer layer of the prickle cells—while the yeast cells were seen only in the corneal layer and not in all sections. The existence of thrush in the buccal cavity of some of these birds along with the histological findings, suggests that *Candida albicans* was an accidental contaminant from the mouth lesions.

Cutaneous streptothricosis has been recorded naturally affecting sheep, cattle, horses and goats, but has not been recorded before affecting turkeys.

Van-Saceghem (1915) described in sheep a disease that he named "dermatose contagieuse" or "impetigo contagieuse," and gave the organism associated with it the name *Dermatophilis congolensis*. Morais (1922) described the same disease in sheep under the name "lumpywool" and associated the disease with the rainfall and the excess of moisture. Seddon (1929) described the same disease in sheep in Australia as mycotic dermatitis of sheep. Bull (1929) described lumpy wool or mycotic dermatitis in sheep in Australia and named the mycelium isolated *Actinomyces dermatonomus*. Lall and Rajogopalan (1950) recorded the disease in India in cross merino lambs.

Conditions resembling lumpy wool or mycotic dermatitis of sheep from which similar organisms were described and isolated have been reported in other species of animals. Thus Albiston (1933) reported a case in calves in Australia in which the organism isolated was similar to *Actinomyces dermatonomus* of Bull (1929) with the exception of the more rapid growth of the bovine strain and the greyish-white appearance of its colonies in contrast to the yellowish colour of the type species of sheep. Beaton (1932) reported the disease in goats where lesions were observed over the abdomen and the inner surface of the forelegs and thighs. Stableforth (1937) in England, Edgar and Keast (1940) in Australia described similar conditions in the horse.

Although the streptothrix found to be the actual cause of the foregoing mycotic dermatitis of the turkey is related in general morphology to the type species of sheep, yet it revealed the following differences:—

1. It showed less branching.
2. Its uniform thickness mainly of one coccoid element in diameter, in contrast to the common two, four or even eight coccoid elements in width of the actinomyces described by Hudson (1937).
3. No bacillary forms were seen in any of the sections as was observed by Bull.
4. In nearly all the cases recorded the mycelia of this organism were found on the surface of the epithelial layer, while in our case in the turkey it was found invading the stratum granulosum and even among the prickle cells, a feature which has not been observed before.

Summary

An account of a form of dermatitis affecting the head and neck of turkeys is described in which the apparent cause is a streptothrix. It differs morphologically in its thickness, in the smaller degree of branching and in the absence of the bacillary forms, from the type species of Bull (1929) and also in invading the outer part of the germinal layer of the skin. The best stain for it seems to be Mallory's method for actinomyces.

The condition appears to be infectious in nature. Keeping the skin dry and treating with iodine preparations cleared the disease.

Acknowledgments.—We should like to express our thanks to Dr. A. W. Stableforth for helpful criticism and advice, to Mr. R. Hudson for examination of sections, to Dr. N. S. Barron for his help and interest in the work, to Mr. R. A. Barker, of Reading University, for the microphotographs, to Miss J. Shoesmith, Mr. F. A. Keep and Mr. P. Simmon, of the laboratory staff at Reading, and to Mr. C. Garland for much technical assistance.

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A Histochemical Study of the Glands of the Anal Sac of the Dog

Our readers will find of interest the following reproduction of an abstract (*Biol. Abstr.* Sect. F. No. 10. p. 26) of an account of a histochemical study of the glands of the anal sac of the dog given by Montana, W., and Parks, H. F. (*Anat. Rec.* **100.** [No. 3] 297-317):—

The anal sacs of the dog are globular or pyriform structures lined by stratified squamous epithelium, each of which opens by a single duct on the lateral margin of the anus. Two types of glands open into each sac: (1) apocrine sudariparous and (2) sebaceous glands, the latter being confined to the duct which conveys the combined secretions to the exterior. Phospholipid droplets, protein substances, acid phosphatase, and cytoplasmic basophilia (ribonucleo-proteins) are found in the epithelial cells of the apocrine tubules. Incineration reveals an abundant white ash residue in the apocrine cells. The sebaceous glands contain demonstrable cholesterol esters, phospholipids, unsaturated glycerides, "plasmal," and alkaline phosphatase. Alkaline phosphatase is found principally in the myoepithelial cells of the apocrine tubules.

* * * * *

Weekly Wisdom

". . . You must remember that veterinary State medicine is always more or less political, and that not the professional side only has to be considered. There are two very obstructive bodies; one is the British public, and the other is the Treasury. Departments ought to be controlled to a certain extent by the public, and they have to be controlled to a very large extent by the Treasury. I do not think you will move a powerful body like the Government Department by heaving abuse at them; it would be better to encourage them a little and obtain their confidence—to say they are doing nicely and so forth, and then step in and tell them how they might do better. . . ."—Sir Stewart Stockman. (1905.) *Proc. 23rd Gen. Mtg. Nat. Vet. Assoc.*, p.90.

ABSTRACTS

[The Survival of Oocysts of Avian Coccidia in the Soil KOUTZ, F. R. (1950.) *The Speculum.* **3.** No. 3.]

Evenly divided groups comprising both sexes of day-old New Hampshire chicks were reared in coccidia-free wire-bottomed battery brooders, and kept in batteries until used for the experiments. Frequent examinations eliminated the possibility of accidental infection, and the food was stored and handled under sterile conditions.

Two types of outdoor wire-enclosed pens were used. The larger pens were 14 ft. square, completely closed with 1 in. square mesh wire netting, and with the sides buried to a depth of 2 ft. The smaller pens were 25 in. square, also completely enclosed with similar netting buried in the soil. Both types were rat- and bird-proof.

Cultures of *E. tenella*, or mixed cultures of *E. tenella*, *E. acervulina*, *E. mitis*, and *E. maxima*, were given orally to coccidia-free chicks, and these were placed in the pens to develop coccidiosis and to contaminate the ground. The pens were then sealed and left vacant for periods between 272 days and one year, during which time the temperature varied between 96° F. and −13° F.

Two methods were used to test the viability of the oocysts in the contaminated pens. Samples of soil were collected from different areas and mixed with the feed given to susceptible chicks, and susceptible chicks were placed in the pens under natural conditions for sufficient time to ingest any available oocysts.

The results showed that *E. tenella* can survive a severe winter, but cannot survive heat. Of all the species studied, *E. acervulina* and *E. mitis* were still infective after one year, but only where protection from sunlight was afforded by grass and weeds. It is concluded that direct sunlight has a deleterious effect on all types of oocyst, whilst grass and weeds offer some protection, and deep shade enables oocysts to survive for long periods. *E. tenella* oocysts may survive a severe winter in sufficient numbers to cause an outbreak of disease in young chicks when placed on the affected ground. The build-up of infection in succeeding groups of chicks takes place quite rapidly and results in severe outbreaks of acute caecal coccidiosis.

J. G. C.

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[Rheumatic Fever and Milk. BUCHAN, T. W. (1950.) *Lancet.* **i.** 467–8.]

On the basis of epidemiological evidence from various parts of the world it is suggested that rheumatic fever may be due to sensitisation by streptococci in milk. One piece of evidence in support of this is stated to be that from 1911 to 1937 in London the death-rate from heart disease in the five to 14 age group fell by 63 per cent., but only by 32 per cent. in rural districts. This is thought to be due to the increase of pasteurisation in London which was much greater than in rural districts. However, even in 1937 the rate in London was nearly twice as high as in rural districts.

J. F.

According to the annual report of the National Association for the Prevention of Tuberculosis, some 400 people die every week in England and Wales from tuberculosis. In 1948 the tuberculosis death-rate was 51·4 per 100,000 of the population. In Denmark the figure was 30; in the United States 33; in Belgium 64; in Scotland 72; in France 74; and in India 200 to 400.

REPORT

Animal Health Trust Fourth Annual Report

The fourth report of the Animal Health Trust bears impressive witness to the advance in independent research which has been made over the last few years. No less than £53,000 has been awarded to date in training scholarships and research fellowships.

Since it began the Trust has arranged for eight research fellows to work at Cambridge, three in the Department of Animal Pathology, two in the Department of Physiology, two in the School of Agriculture, and one in the Department of Zoology. One fellow has worked in the Department of Biochemistry, Oxford, two at Edinburgh, one at Bangor, three at the London School of Hygiene and Tropical Medicine and one in the Pathology Department of Guy's Hospital. In addition, six research fellows have been enabled to study in the U.S.A.

At the Farm Livestock Research Station, research has already begun on acetonaemia in cattle, rickets in sheep and trichomonas infection in bulls. At the Equine Research Station work has continued on red worm infestation and on the diseases of foals, on basic study of the heart using the electrocardiograph, and surgical studies on metals and alloys. Work at the Canine Research Station progresses on night-blindness in red setters, leukaemia and on various distemper-like diseases in the dog. The Poultry Research Station now has a control flock of 1,300 and investigation continues into avian leukosis, coccidiosis, blackhead in turkeys, incubator and hatchery hygiene.

One looks forward to the issue of the next report to see what further advance has been made on this wide front.

N. M.

NOTES AND NEWS

Diary of Events

Jan. 17th.—Annual General Meeting of the Royal Microscopical Society, Tavistock House South, Tavistock Square, London, W.C.1, 6 p.m. (Presidential Address: Dr. G. M. Findlay—"The Virus and the Cell").

Jan. 19th.—Annual General Meeting of the Mid-West Division, N.V.M.A., at Bristol (Berkeley Café, Clifton), 2.15 p.m.

Jan. 26th.—North Wales Division, N.V.M.A. Dinner-Dance, at the Waterloo Hotel, Bettws-y-Coed, 7 p.m.

Jan. 27th.—Meeting of the Biochemical Society, in the Post-graduate Medical School, Ducane Road, London, W.12, 10.30 a.m.

Jan. 27th.—Meeting of the British Association of Allergists, at the Royal Society of Medicine, 1, Wimpole Street, W.1, 2.30 p.m. (Discussion on Veterinary and Comparative Allergy).

Jan. 30th.—Meeting of the Western Counties Division, N.V.M.A., at Exeter (Royal Clarence Hotel), 2 p.m.

Jan. 31st.—Royal (Dick) Veterinary College Annual Ball, in the Assembly Rooms, George Street, Edinburgh, 8.30 p.m.

Jan. 31st.—Meeting of the West of Scotland Division, N.V.M.A., in the Glasgow University Veterinary School, 2.30 p.m.

QUARTERLY MEETINGS OF COUNCIL AND STANDING COMMITTEES N.V.M.A. DURING 1951

The following dates have been fixed for meetings next year, chiefly to give members plenty of time to reserve hotel accommodation

IN LONDON

Monday, January 22nd:

2.30 p.m. Parliamentary and Public Relations Committee.
3.30 p.m. Veterinary State Medicine Committee.

Tuesday, January 23rd:

10 a.m. Home Appointments Committee.
11.30 a.m. Organising Committee.
2.15 p.m. General Purposes and Finance Committee.

Wednesday, January 24th:
11 a.m. Council.

In London

Monday, April 16th:
2 p.m. Organising Committee.
4 p.m. Parliamentary and Public Relations Committee.

Tuesday, April 17th:
10 a.m. Veterinary State Medicine Committee.
12 noon Home Appointments Committee.
2.15 p.m. General Purposes and Finance Committee.

Wednesday, April 18th:
11 a.m. Council

In Edinburgh

Wednesday, July 11th:
11 a.m. Home Appointments Committee.
2 p.m Organising Committee.
4 p.m. Parliamentary and Public Relations Committee.

Thursday, July 12th:
11 a.m. Veterinary State Medicine Committee.
2 p.m. General Purposes and Finance Committee.

Friday, July 13th:
11 a.m. Council.

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PERSONAL

Captain S. E. Hill Honoured

We much regret the omission, from the references to the Birthday Honours published in our last issue, of the award to Stanley Edward Hill, Capt. late R.A.V.C., of Malthouse, Great Massingham, King's Lynn, Norfolk, of Membership of the Royal Victorian Order (M.V.O., Fourth Class).

His colleagues in the profession, more particularly those in East Anglia, will be delighted to learn of this award. Captain Hill recently sold his practice and retired to Great Massingham after 52 years in practice at East Rudham, during the whole of which period he was Veterinary Surgeon to the Sandringham Estate and also attended sick and injured animals belonging to various members of the Royal Family. On the late afternoon of the Monday on which the awards were announced, Captain Hill was received by the King at Sandringham House when His Majesty invested him with the insignia of Membership and also presented him with a photograph signed in his own handwriting, as a memento of many years of service (the King's own words).

Captain Hill served in France with the Royal Army Veterinary Corps during the 1914-18 war, and was mentioned in dispatches. He received a Portuguese decoration for his work in connection with diseases among horses and mules.

. . . . .

Births.—Murray.—On December 27th, 1950, at St. Helen's Hospital, Hastings, to Pamela, wife of D. S. Murray, a second son, Mark Hamilton.

Shaw.—On December 28th, 1950, to Hilda (*née* Patchett), wife of Josiah A. Shaw, 12, Arnold Road, Manchester, 16, a son.

. . . . .

Forthcoming Marriage.—Moss—Parker.—The engagement is announced between Roy, only son of Mr. and Mrs. A. S. Moss, of Birstall, Leicester, and Elizabeth May, youngest daughter of Mr. J. Parker and the late Mrs. Parker, of Fencehouses, Co. Durham.

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R.C.V.S. OBITUARY

Hunt, Thomas Mark Chambers, Capt. late R.A.V.C. (T.A.), Bridge View, Crowmarsh, Wallingford, Berks. Graduated London, May 30th, 1894. Died December 30th, 1950; aged 78 years.

Riley, Percy Brown, Major R.A.V.C. (retd.), I.V.S. (retd.), 52, Murrayfield Gardens, Edinburgh. Graduated Edinburgh, May 17th, 1911. Died December 29th, 1950; aged 63 years.

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R.C.V.S. COUNCIL ELECTION

The Registrar, R.C.V.S., would remind all members that the closing date for the receipt of nomination forms for the forthcoming R.C.V.S. Council election is January 31st. Nomination forms may be obtained on writing to him at 9, Red Lion Square, London, W.C.1.

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INTERNATIONAL CONGRESS OF MILITARY MEDICINE

The 13th International Congress of Military Medicine and Pharmacy will be held at Paris in 1951 (June 17th to 23rd) and is open to all doctors, pharmacists, dentists, veterinary surgeons, and administrative officers on the active or reserve lists of all armed forces. The scientific meetings will be taken under the following heads: principles of tactical organisation for first aid for large numbers of wounded; organisation of training and provision of a career in military medicine; medical problems raised by aerial and submarine navigation; medical aspects of defence against atomic, biological, and chemical warfare; the role of the military pharmacist. Additional papers may be read if they are submitted before April 1st, 1951. Full information can be obtained from the Secretariat General of the Congress, Section Technique du Service de Santé, 8 bis, Rue des Récollets, Paris 10e.

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ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Swine Fever:

Angus.—Crudie Farm, Arbirlot, Arbroath, Angus (Jan. 4th); 13 Holding, West Pickerro, Broughty Ferry, Dundee (Jan. 6th).

Hants.—Copse Farm, Eversley (Carcase at: Farnborough Abattoir, Peabody Road, Eversley (Jan. 3rd).

Lancs.—Oakenhead Farm, Whitechapel, Goosnargh (Jan. 1st); Hankinsons Farm, Esprick, Nr. Kirkham, Lancs (Jan. 6th).

Lincs (*Lindsey*).—Bank Farm, Huttoft, Nr. Alford (Jan. 1st); Santon Allotments, Scunthorpe, Lincs (Jan. 4th).

Notts.—30, Castle Hill, Worksop (Jan. 1st); Langold Farm, Langold, Nr. Worksop, Notts (Jan. 6th).

Staffs.—Pig Club, Royal Ordnance Factory, Swynnerton, Stone (Jan. 1st).

Suffolk (*E.*).—Charsfield Hall, Charsfield, Woodbridge, Suffolk (Jan. 6th).

Yorks (*E.R.*).—Butcher Row, Beverley, Yorks (Jan. 4th).

Yorks (*N.R.*).—Penneyflatts Farm, Stillington (Dec. 30th).

Yorks (*W.R.*).—Topcliffe Farm, Tingley, Wakefield (Jan. 1st); 127, Barugh Lane, Barugh Green, Barugh, Barnsley (Jan. 3rd); 71, Corporation Allotments, Decoy Bank, Doncaster (Jan. 4th); 71, Baslow Road, Totley, Sheffield (Jan. 5th); Rosedene Farm, Walton Road, Wetherby, Yorks (Jan. 6th).

Wigtownshire.—Clandrie Farm, Kirkcolm Parish, Stranraer (Jan. 1st).

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FARMING WELCOME FOR TUBERCULOSIS ERADICATION PLAN

"Now that the scale of compensation for reactors compulsorily slaughtered under the tuberculosis eradication scheme has been announced we see that the representatives of the N.F.U. and the Milk Boards, who negotiated this knotty problem with the Ministry, have served us well," observes the *Farmer & Stock-breeder* in its issue of January 2nd, and continues: "Compensation for each animal will be an amount equal to its market value as an untested animal, subject to a maximum figure of £100. Furthermore, the owner of an animal valued at more than this not ungenerous figure, will be given the option of removing it under licence to premises not in an eradication area or attested area, thus ensuring the preservation of valuable breeding stock. More important than the compensation limit is the method of determining the market value and, here again, there seems to be nothing at which to cavil. Failing agreement between the owner and a Ministry official an independent valuer will be appointed jointly and paid by the Ministry. Alternatively, valuers will be nominated by the auctioneers' institutes.

"The area eradication plan has got away to a good, though rather belated, start. As far as may be judged without actual experience of the scheme in action, the financial aspects are satisfactory and it remains for producers themselves to push ahead as fast as they are able. The first eradication areas, in Scotland and Wales, will be declared on October 1st, 1952. Before that date every assistance will be given to those entering the Attested Herds Scheme voluntarily. Free testing is offered, as well as the attested bonuses, so that the cost of going attested should not be a deterrent. It is important to remember, however, that the picture will change as soon as an area is declared an eradication area. If a farmer takes no steps to clean up or starts so late that his herd is neither Supervised nor Attested by the time that an order declaring an eradication area is made, he will have lost his chance of qualifying for bonus payments. His herd will be compulsorily tested and the Minister will have power to slaughter any reactors found. He will, of course, receive compensation for these, but the fact that he will not qualify for the bonuses is a sobering thought.

"The Ministry is to be congratulated on its initiative. We

have urged before that the campaign should be provided with a permanent driving force by the appointment of a small committee chosen from the Ministry, the N.F.U. and the Milk Boards. It is essential that constant forward progress should be made and the responsibility rests equally on all branches of the farming community. A bold, imaginative scheme has been formulated and set in action. The Ministry has, throughout, consulted with those most closely concerned. It is our scheme now and it is up to us to make it work, so that we no longer lag behind those countries which have already freed their cattle from the tuberculosis menace."

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the N.V.M.A.

FOWL PEST (NEWCASTLE DISEASE)

Sir,—It is now some years since this country was free from Newcastle disease. Following the introduction of the disease from Central Europe in 1947, the incidence has varied from time to time but it is doubtful if the infection has been entirely absent since its introduction. Practically all the outbreaks have been of the acute type of the disease and have been different from the milder or subacute type now recognised as widespread in the United States. In 1948 there was recovered from a group of fowls a strain of virus of very low virulence, but since that time there has been no further evidence of the existence of similar strains in the country.

In November of last year it became evident that outbreaks of the sub-acute type of Newcastle disease were occurring in East Anglia and so serious did the position become that an Order (The Live Poultry (East Anglia) (Restrictions) Order, 1950) was applied. In East Anglia this form of the disease has continued to spread.

Early in December the National Poultry Show was held in London. There is now evidence that some birds which had been at the show, on their return to their home premises, showed symptoms of the sub-acute type of Newcastle disease. Taking into consideration the lack of definite information on the extent and distribution of this type of the disease a further Order (The Live Poultry (England and Wales) (Restrictions) Order, 1950) came into force on December 26th.

It is impossible to forecast whether the present method of slaughter and compensation can continue to be effective for the eradication of the disease or whether recourse will have to be made to other methods of control, *e.g.*, vaccination: the information which we expect to acquire during the next few weeks will, it is hoped, enable a decision to be made.

The position in England and Wales is serious and the Ministry of Agriculture, through the Animal Health Division, is endeavouring to assess the position as rapidly as possible. In the meantime an appeal has been launched to all concerned in any way with poultry to assist the Ministry by reporting immediately the occurrence of suspicious symptoms and by taking every precaution to prevent the introduction of the infection into poultry premises and the spread of the disease.

Veterinary surgeons and others can assist by drawing the attention of poultry keepers to the seriousness of the position and by timely advice on reporting suspected outbreaks and on methods of preventing the introduction and spread of the disease. The Ministry will be grateful for the active collaboration of the veterinary profession in these directions.

The following is a description of the symptoms, etc., of this sub-acute form of the disease:—

Dullness and ruffled feathers in a number of birds. Birds refuse food, and in "layers" there is usually a sudden marked fall in egg production. Slight watery discharge from the eyes and nose with consequent sneezing and head-shaking. Difficult respiration with accompanying throat "gurgle." Loose greenish coloured droppings may be passed, or there may only be staining and "pasting" of vent feathers. Normally only a few birds die and recovery generally commences in three or four days to a week. Birds may return to apparently normal health in three or four weeks though egg production may be further delayed. Recovered birds are dangerous because they can still cause outbreaks of disease by contact or hatching eggs.

The highly infectious nature of the disease demands the greatest care in the taking of adequate precautions by personal disinfection, etc.

Yours faithfully,
T. Dalling.

Ministry of Agriculture and Fisheries,
Hook Rise, Tolworth,
Surbiton, Surrey.
January 8th, 1951.

PREGNANCY FOLLOWING CAESAREAN SECTION IN A COW

Sir,—I was very interested to read Mr. Nye's letter in *The Veterinary Record* of December 9th, 1950.

Published references to pregnancy after the caesarean operation appear to be few in number, but whilst reviewing the available literature on the subject the following facts were noted:—

Laue[1] mentions two of his cases which calved after a previous operation, while Stewart[2] reports having performed the caesarean operation on the same Jersey cow at successive pregnancies. So far as I am aware, Stewart's contribution is the only published report on "Multiple Caesarean Section" in the bovine although Farquharson,[3] of Colorado, has performed this operation on the same cow at three successive pregnancies. My colleague, Dr. D. D. Delahanty,[4] performed the operation on two occasions on the same Ayrshire cow. After the first operation, the cow developed a metritis and had a prolonged treatment before recovery. The next encounter with the case was at the succeeding pregnancy. At this time she had uterine inertia with inadequate dilatation of the cervix as a result of bacterial infection and subsequent scarring.

I cannot, however, agree with Mr. Nye's statement[5] that the cutting of the abdominal muscles in the rumenotomy and caesarean operation has been discarded. To my belief most veterinarians still incise rather than break down the musculature whilst opening the bovine abdomen and in all such abdominal incisions made by the writer both in England and Colorado, the incision of the muscle layers has given complete satisfaction, first intention healing almost invariably being the rule. The few exceptions were where infection with *Actinomyces necrophorus* had gained access to the wound, but in no such case did disruption of the abdominal muscles occur.

Yours faithfully,
F. J. Milne.

Department of Surgery and Clinics,
Colorado A & M College,
Fort Collins,
Colorado.

References

1. Laue, W. *Vet. Rec.* **61.** 545.
2. Stewart, J. M. *Aust. Vet. J.* **21.** 41.
3. Farquharson, James. Personal communication.
4. Delahanty, D. D. Personal communication.
5. Nye, S. S. *Vet. Rec.* **61.** 883.

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RINDERPEST IMMUNISATION

Sir,—I am reluctant to join issue with so distinguished a scientist as Dr. J. T. Edwards and on a subject in which he is a recognised expert, namely rinderpest immunisation with goat-attenuated virus; but I cannot allow to pass unchallenged the opinions he expressed in the course of his remarks on the paper by Mr. Lawson on Strain 19 and the Control of Brucellosis. (Reported in the issue of *The Veterinary Record* of December 30th, 1950). In support of the opinion of Mr. A. J. Wright, the opener of the discussion on Mr. Lawson's paper, that Strain 19 vaccine had a beneficial effect when given to cattle already infected with *Br. abortus*, Dr. Edwards argued that this good effect was analagous to what happened when cattle infected with rinderpest were given a dose of goat-attenuated virus vaccine. He stated that it had been strikingly brought home to him in Egypt that cattle actually in the early stages of natural attack of rinderpest would be found to recover if they were given an injection of the attenuated virus vaccine.

Dr. Edwards explained this good effect of the attenuated virus on the principle of the "interference phenomenon" where the weaker virus when injected into infected animals actually gained on the stronger natural virus in the body and was able to spread its particles over the surface of the vulnerable cells, thereby forming a protective covering against the stronger virus. I wonder how many veterinary workers in Africa would agree with Dr. Edwards in regard either to his broad facts on the curative effects of attenuated virus vaccine or to his theories to explain them.

For years past in Kenya and Nigeria, ever since the introduction in 1913 of the virus-serum method of immunisation and more recently of the use of goat virus vaccine, it has been the practice of veterinary officers when dealing with natural outbreaks of rinderpest to inoculate all cattle in infected herds as the best way to cut short the outbreak and reduce the mortality. But the good effects of this method of attack were not explained on the principle of the interference phenomenon but simply that the animals

had received protection (immunisation) ahead of natural infection. In natural outbreaks of rinderpest in the field and more especially among native herds, where a varying proportion of the animals are either immune or at least resistant, it takes quite a time, probably up to three or four weeks, before all susceptible animals become infected. It is thus possible where attenuated virus vaccine is used early in an outbreak for a goodly proportion of the animals to become immunised before the natural infection has gained a foothold in them. But in the reverse situation, where natural infection has gained precedence of entry, I maintain that attenuated virus vaccine can have no effect on the subsequent course of the disease.

Experiments carried out by Mettam at Vom about 1943 or 1944 prove this point. The results of these experiments demonstrated that the attenuated virus vaccine must have a lead on the natural infection of at least 48 hours before any beneficial effects from the vaccine can be expected.

These results were amply corroborated in the field when dealing with large numbers of infected herds; indeed the concern of field officers was that the vaccine had high enough antigenic power rather than it possessed any curative properties. Any weakening of the antigenic power of the vaccine allowed the natural infection to run its baneful course.

Yours faithfully,

Arran View, W. W. Henderson.
West Kilbride,
Ayrshire.

January 4th, 1951.

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"A NEW TAENIACIDE FOR DOGS"

Sir,—The clinical communication by J. K. Biddis and the letter by G. L. B. Henderson on the use of "Dicestal" prompt me to comment.

I have used "Dicestal" (May & Baker, Ltd.) and have found the drug effective in the cat at the dosage rate of 0·5 g. per 6 lb. bodyweight. The number of cases has been small, but the results apparently 100 per cent. effective.

In the dog there appear to be several disadvantages:—

Firstly the frequency of vomiting. This has been controlled by the administration of chloretone (1 to 3 grs. dependant on bodyweight) 20 minutes prior to dosage.

Secondly the administration of many large tablets (I recall administering 20 tablets to a 160 lb. Great Dane—0·5 g. per 8 lb. bodyweight—with effective result).

Thirdly about a third of dosed dogs show evidence of colic and/or diarrhoea.

Fourthly, in practice it is difficult to assess the efficacy at the time of treatment due primarily to the non-appearance of the tape worms, but I believe it to be in the region of 80 to 90 per cent.

Nevertheless I prefer a modification of an older method which I find almost 100 per cent. effective and which has the advantage of removal of the worm so that results may be shown if required. The details I hope to send in a clinical communication in the near future.

Yours faithfully,

326, West End Lane, Churchill Frost.
London, N.W.6.

January 6th, 1951.

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Sir,—In *The Veterinary Record* **62**, p. 841 (December 30th, 1950), Mr. J. K. Biddis records his experience of the use of 2:2'-dihydroxy-5:5'-dichlorodiphenylmethane ("Dicestal" May & Baker) for tapeworms in dogs and states ". . . results . . . were spectacular, *i.e.*, no further segments appeared after the day of administration . . . Over 50 cases . . . have been dealt with effectively in this manner . . . the desired effect was obtained in all treated cases."

It is not stated for how long these cases were followed up.

In the writer's experience "Dicestal," while very useful, has not proved nearly so effective. Of 18 dogs treated, nine were passing segments within two months of treatment, according to the statements of the owners. When these animals were presented with a history of having passed segments, of five of the nine it was recorded by myself or my colleagues, Miss E. Gordon and Mr. W. B. Martin, that segments were present near the anus, so it is assumed that the owner's statements are fairly reliable.

Of the nine, two never stopped passing segments (one of these vomited two hours after dosing), in one recurrence was noted at 12 days, in another within one month, in three within six weeks, and in two within two months. Seven of the 18 showed diarrhoea after dosing, never of a violent nature.

Of the nine in which no recurrence was recorded, three were followed up for five months, and the remainder for only one month or less.

Dosage was on the same scale as used by Mr. Biddis (0·50 gm. per 6 lb. to 8 lb. bodyweight) and tended to the higher level almost invariably. No constant recommendation to withhold subsidiary feeds after dosing was made, and dosing was usually left to the owner, two factors which may have reduced the apparent efficiency of the drug.

Yours faithfully,

Small-animal Clinic, Ian M. Lauder.
University of Glasgow,
Veterinary School.

January 6th, 1951.

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FRACTURED LEGS IN HORSES

Sir,—With reference to Major Hamilton Kirk's letter on the above subject, I whole-heartedly agree with him that a considerable number of leg fractures, mostly sustained on the race course, ought to be treated and not destroyed. I, personally, would be only too willing to go to the expense of procuring adequate equipment to treat fractures of the leg if I could get any cases to treat, but alas! I am unable to persuade the owner of a horse with leg fractures to have it treated. One can well appreciate their point of view in the case of a race horse which is fully insured. I believe the first move in preventing destruction of such horses will have to come mainly from the Insurance Companies concerned.

Surely it would pay the Insurance Companies to have all horses (insured with them for £1,000 or more) which sustain a fracture on the race course, to have them thoroughly examined by a member of our profession and if, in his opinion, there is a good prognosis for complete (or in the case of mares partial) recovery, *i.e.*, to have unimpeded use of the affected leg, to finance the treatment and livery during treatment of the horses in question.

I certainly would like to procure five or six such cases at "knacker value" and take the risk of success or failure if only from the experimental point of view, as I feel so strongly on the matter. Admittedly I have looked at it only from the financial point of view. If an owner is sentimentally attached to a horse, then he or she is willing to go to the expense of treatment and all that goes with it, if it is pointed out that there is a good chance of recovery, irrespective of any action taken by the Insurance Companies as previously suggested.

Major Hamilton Kirk has offered to give his services entirely free in treating fractures; I am only too willing to offer my stables to house and nurse such cases and to give any other assistance which is in my power.

I should like to add that while serving in the R.A.V.C. during the war in India I was successful in repairing a compound fracture of the metacarpus in a small mule; that is the reason why I think as a profession we should give serious thought to Major Hamilton-Kirk's article on "Fractured Legs in Horses."

Yours faithfully,

A Horse Owner and Lover (M.R.C.V.S.).

Note:—The Editor will give the name and address of the writer of this letter to anyone wishing to make use of his stables, etc., for treatment of fractures in the horse.

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A "COLONIAL" SUPPLEMENT

Sir,—I should like to put forward a suggestion concerning the wider circulation of the knowledge and experience gained in African and other colonies by veterinary research and field workers. Much of this information, although perhaps not of deep concern to the general practitioner in this country, would be of undoubted value to research workers here and elsewhere and there could be no better way of giving it the circulation it deserves than by the issue periodically by *The Veterinary Record* of a Colonial Supplement composed of material offered by Colonial workers. Fairly comprehensive reviews of Departmental Annual Reports could also be included in the supplement. By giving this information in the form of a supplement and not included in the general issue of *The Veterinary Record*, the interest of the paper to practitioners would not be affected.

Yours faithfully,

Arran View. W. W. Henderson.
West Kilbride,
Ayrshire.

January 4th, 1951.